NOTE ON THUNDERSTORM BREEDING SPOTS.

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Mr. R. E. Horton's articles[1] on "Thunderstorm breeding spots" and "The beginning of a thunderstorm" recalls to mind my experiences some years ago in watching the growth and decay of local thunderstorms in Florida. I was fortunately located for thunderstorm observation. Less than 100 miles directly to the west lay the center of maximum thunderstorminess in the United States, the Tampa Bay region, where a 10-year average of 94 storms has been recorded. The central east coast of Florida, where the storm herein described took place, lies in a region of 70 to 80 storms annually, and hence may be considered a thoroughly successful thunderstorm factory.[2] So far as my observation goes (covering three thunderstorm seasons) the storms are so localized that their occurrence may be explained on the basis of rather small topographic details. There is here, in other words, a first-rate thunderstorm breeding spot.

The general summer conditions in peninsular Florida are, of course, extremely favorable to the development of local thunderstorms. Cyclonic weather control, while not entirely absent, is so obscured by local controls as to be little in evidence. Under such conditions the detailed features of the country as affecting local weather become correspondingly important. I believe that in the central east coast region, flat though it is, they constitute the major control. Along this coast extends a belt of flat, open-forest, sandy country, some 10 to 15 miles wide. This belt separates the two great sources of atmospheric moisture of the region. On the east is the Atlantic Ocean, and between it and the mainland, separated from the mild-temperatured waters of the Gulf Stream by a barrier beach, lies a wide, very shallow and very warm lagoon—the Indian River of citrus-fruit fame. On the west of the pine belt lies a vast area of what are locally known as "muck lands," which in their undrained portions and especially in the thunderstorm season expose broad areas of partly flooded marsh to an intense subtropical sunshine. The prevailing wind direction is then between south and east, essentially a summer monsoon, a partially reversed northeast trade wind. It is a significant fact that although large numbers of cumuli may usually be seen over the pine belt as a whole, the region of most frequent thunderstorm activity is the western part of it and the eastern part of the "muck lands." Doubtless the relatively dry, sandy soil of the pine land causes more active convection than the marsh country; while the onshore winds, besides bringing much moisture, cause the visible effects of convection to be most marked over the leeward side of the pine belt and the adjacent marsh. I have counted as many as six storms in operation simultaneously along this border zone, each apparently consisting of a single vigorously grown cumulo-nimbus in most cases, so narrow in proportion to its height that it shadows but a few hundred acres. Frequently, however, there is a merging into a massive cloud spreading over several square miles and displaying most impressive electrical energy. The spectacle of the towering heads, the black bases, and curtains of rain, all against a background of clear blue sky, is beautiful beyond description.

Being thus located in a thunderstorm-breeding spot, I had the good fortune on one occasion to be under a thunderstorm cloud during its formation, and to observe the growth and decay of the storm all within the short space of an hour. It was in midafternoon of a particularly hot and still day when a dark clot of cloud formed directly overhead. For some minutes nothing of it was visible except its gradually spreading shape, which grew rapidly darker and soon cast its cool shadow over many acres, while moving with an almost imperceptible motion inland. Presently occurred one of the most splendid cloud phenomena I have seen. The combined growth of the cloud and its westerly drift having maintained the eastern side of it approximately in the zenith, there suddenly emerged from behind the black base and far aloft a number of gray and partly sunlit protuberances, the turbulent heads of the upper part of the cloud. The sense of cloud height which that flash of perspective afforded, I have never experienced before nor since. Motion of the air at the earth's surface was barely noticeable and from the east. The only signs of air motion at the base of the cloud were the faintly visible writhings of dark rags of vapor drawing in toward the edge of it. But aloft, the rapid bulging of the heads showed how violent were the ascending currents within the cloud. It would have been impossible to measure the full height of this cloud, and so the speed of its growth, even had I had the means, so close overhead was it. However, the protuberances emerged from behind the base certainly not more than 15 minutes after the beginning of formation. Assuming a growth in that time of 15,000 feet (from my experience in watching other Florida storms this is a very moderate estimate), the velocity of updraft would be 16.6 m. p. s., or 37+ miles per hour.

Muttering of thunder soon became audible. Shortly thereafter a gray drapery of rain was lowered to earth perhaps 500 yards away, and in it the forms of the pines stood like ghosts, the more distant more ghostly than the nearer. By the time the first lightning flash occurred (not more than 20 minutes after I first observed the cloud overhead) the cloud had drifted toward the west sufficiently for a magnificent view up its side to be possible. I estimated the angular altitude of the highest visible part of it as never less than 45°, and during most of the time much more than that, so very slow was the horizontal motion. The rain lasted some 15 minutes, and within an hour from the first observation the cloud had nearly evaporated. This little storm was but one of several that developed along the margin of the pine belt during that afternoon, the others, however, being too distant to afford more than the usual wonderful cloud scenery of a Florida summer.

[1] MO. WEATHER REV., April, 1921, 49: 93-94.

[2] Alexander, W. H.: Distribution of thunderstorms in the United States. MO. WEATHER REV., vol. 43, no. 7, July, 1915, pp. 322-340, chart no. 83.
Cf. also Henry, A. J.: Progressive movement of thunderstorms. MO. WEATHER REV., Sept., 1896, 24: 331-332.